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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/753,608	01/08/2004	Robert L. Fair	112056-0148	6334

24267 7590 08/10/2007

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EXAMINER	
PORTKA, GARY J	
ART UNIT	**PAPER NUMBER**
2188	

MAIL DATE	DELIVERY MODE
08/10/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

MN

Office Action Summary	Application No.	Applicant(s)	
	10/753,608	FAIR, ROBERT L.	
	Examiner	Art Unit	
	Gary J. Portka	2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-72* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-72* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *herewith* .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 17, 2007 has been entered. Claims 1, 16, 22, 28, 34, 39, 41, 44, 49, and 54 have been amended, and claims 69-72 have been added. Claims 1-72 are pending.

Response to Arguments

2. Applicant's amendments and arguments submitted on May 17, 2007, and in the interview of August 2, 2007 (summary attached), have been fully considered but are not persuasive. Applicants argue that Permut does not teach readset data structures associated with client-requested data, and establishing a read stream corresponding to each readset data structure. In the interview the argument was further clarified as being that each client has a corresponding read data structure that depends upon that client. Examiner does not agree that the claim language requires this latter argument, only that there are a plurality of readset data structures "associated with the client-requested data". This language may be interpreted as a plurality of structures that are all associated with the requested data of a single client, or of multiple clients. The claims do require read streams for each structure, but not structures for each client.

3. Permut states that the "host access request may include commands or flags which provide prestaging and/or sequential hints" (col. 8 lines 59-60). Any such use of commands or flags requires some format or organizational scheme of the data (of the commands or flags) to be recognized so that the data therein may be used as desired, and thus reads on the limitation of "data structure" to the extent claimed. See MPEP 2106.01, which defines data structure as "a physical or logical relationship among data elements, designed to support specific data manipulation functions". Clearly the system of Permut would have to be able to identify the relevant flags or commands, and thus must use the physical or logical relationship thereto to be able to use the hint therein for prestaging. These data structures are associated with client-requested data as claimed, since they are included in host access requests. These data structures also establish read streams corresponding thereto, since each hint controls a stream of prefetch data.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1, 16, 22, and 28 each recite determining if retrieval of readahead data is permitted, and if so, locating readset data structures. However, it appears that

the readset data structures are required before it can be determined if retrieval of readahead data is permitted. See Fig. 9A, where readsets are located at 910, and readahead permission is determined at 920. Since location of readset data structures dependent upon determination of readahead retrieval permission has not been disclosed, the present claims are not enabled by the specification. Claims 2-15, 17-21, 23-27, and 29-33 include these limitations by dependency.

Claim Rejections - 35 USC § 102

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1-14 & 16-72 are rejected under 35 U.S.C. 102(b) as being anticipated by Permut et al. (US Patent # 6,260,115), herein Permut.

8. As per Claims 1, 16, 22, 28, 34, 39, 41, 44, 49, 69, and 71, Permut discloses *a method, apparatus with means for, storage system, and computer readable media with instructions for having a storage operating system implemented in a storage system to optimize the amount of readahead data retrieved for a read stream established in a data container stored in the storage system, the method comprising: receiving a client read request at the storage system at a network adapter, the client read request indicating client-requested data for the storage operating system to retrieve from the data container containing the read stream* [Figure 7A, #700]; *determining whether the storage operating system is permitted to retrieve readahead data from the data container in response to the received client read request* [Figure 7A, #702]; *if it is determined that the storage operating system is permitted to retrieve readahead data*

from the data container ["Yes" branch of Figure 7A, #702 & #704], *performing the steps of: (i) locating one or more readset data structures associated with the client-requested data and establishing a read stream corresponding to each structure* (since the command fields or flags at col. 8 lines 59-60 providing hints must be "located" to the extent claimed, and these hints indicate how far to read ahead, thus establishing a corresponding read stream), *(ii) selecting an amount of readahead data to retrieve from the data container based on a plurality of factors* ["Yes" branch of Figure 7A, #704 & Figure 7B, #720] *stored within a readset data structure associated with the read stream* [seeing the data structure as the commands or flags which contain the hints for prestaging, col. 8 lines 59-60]; *and (iii) retrieving the selected amount of readahead data from the data container* [Figure 7B, #729, col. 1 lines 19-22, Column 3, Lines 31-49, Column 8, Line 46 – Column 9, Line 8 & Column 10, Lines 32-59].

9. As per claims 54 and 55, Permut discloses the method substantially as described above; *adjusting as requests are processed, the plurality of factors stored within the data structure associated with each stream to optimize amount of readahead data is cached for each read stream* is also disclosed [the processing of multiple host requests, each with their associated prestage commands or flags, is seen as the adjustment of the data structure as recited, also see Column 8, Line 46 – Column 9, Line 8 & Column 10, Lines 32-59].

10. As per Claims 2, 17, 23, 29, 43, and 56, Permut further discloses *wherein the data container is a file, directory, vdisk or lun* [Column 1, Lines 12-33 & Column 2, Lines 29-48].

11. As per Claims 3, 18, 24, and 57, Permut further discloses *wherein the storage operating system is determined to be permitted to retrieve readahead data from the data container when the client-requested data extends the read stream past a predetermined next readahead value* [Figure 7B, #722, #732, #734 & Column 11, Lines 38-48].

12. As per Claims 4 and 58, Permut further discloses *wherein the predetermined next readahead value is stored in a readset data structure associated with the read stream* [Figure 2, #200, #204, #210 & Column 11, Lines 38-48].

13. As per Claims 5, 19, 25, and 59, Permut further discloses *wherein the predetermined next readahead value is updated based on a percentage of the selected amount of readahead data* [Figure 7B, #740, #742, #744 & Column 11, Line 60 – Column 12, Line 12].

14. As per Claims 6 and 60, Permut further discloses *wherein a read-access style associated with the data container is one of the plurality of factors used to select the amount of readahead data* [Figure 2, #206 & Column 4, Lines 30-39].

15. As per Claims 7, 40, and 61, Permut further discloses *wherein the selected amount of readahead data equals zero if the read-access style corresponds to a random read-access style* [Column 2, Lines 51-66, Column 4, Lines 40-52 & Column 6, Lines 16-47].

16. As per Claims 8 and 62, Permut further discloses *wherein a number of client read requests processed in the read stream is one of the plurality of factors used to select the amount of readahead data* [Column 4, Lines 53-67].

17. As per Claims 9 and 63, Permut further discloses *wherein the number of client read requests processed in the read stream is stored as a count value in a readset data structure associated with the read stream* [Figure 2, #208].

18. As per Claims 10 and 64, Permut further discloses *wherein the amount of client-requested data is one of the plurality of factors used to select the amount of readahead data* [Column 5, Lines 1-6].

19. As per Claims 11, 38, and 65, Permut further discloses *wherein the selected amount of readahead data is set equal to a predetermined upper limit for large amounts of client-requested data* [Column 4, Lines 7-21].

20. As per Claims 12, 27, 35, 36, and 66, Permut further discloses *wherein the selected amount of readahead data is doubled if the number of client read requests processed in the read stream is greater than a first threshold value* [Column 10, Lines 47-59].

21. As per Claims 13, 31, 46, 51, and 67, Permut further discloses *wherein the client-requested data is identified as read-once data when either (i) the number of client read requests processed in the read stream is greater than a second threshold value* [Figure 2, #208 & Column 4, Lines 6-21] *or (ii) a set of metadata associated with the read stream indicates that the client-requested data is read-once data* [Figure 2, #206 &

Column 11, Lines 38-48; an entry's position on a candidate list, as disclosed by Permut, is functionally equivalent to "metadata" claimed by applicant because they both identify read-once data requested from a client].

22. As per Claims 14, 30, 32, 33, 45, 47, 48, 50, 52, 53, and 68, Permut further discloses *wherein the selected amount of readahead data is stored in one or more buffers enqueued on a flush queue, the flush queue being configured to reuse buffers after a predetermined period of time* [Column 3, Lines 11-30 & Column 5, Lines 15-18].

23. As per Claims 20 and 26, Permut further discloses *wherein the plurality of factors used to select the amount of readahead data includes at least one of: (i) the amount of client-requested data* [Column 5, Lines 1-6], *(ii) a number of client read requests processed in the read stream* [Column 4, Lines 53-67], *and (iii) a read-access style associated with the data container* [Figure 2, #206 & Column 4, Lines 30-39].

24. As per Claim 21, Permut further discloses *wherein the selected amount of readahead data is doubled if the number of client read requests processed in the read stream is greater than a first threshold value* [Column 10, Lines 47-59].

25. As per Claim 37, Permut further discloses the method of claim 36, further comprising the step of rounding, the selected amount of readahead data to the size of a data block [Column 1, Lines 55-59]. *Examiner understands that Permut teaches prestaging whole data blocks, which would inherently require a rounding step to achieve such prestaging.*

26. As per Claim 42, Permut further discloses *wherein the step of selecting an amount of readahead data further comprises: determining whether a flag is associated with the read stream* [Figure 2, #202], *the flag indicating that the storage system is associated with more than a predetermined number of storage devices* [Column 9, Lines 46]; *and in response to determining whether the flag is associated, selecting the amount of readahead data* [Column 9, Lines 43-56; Permut sets the Flags 202 to active/inactive depending on whether the entry is referenced by the storage systems and is functionally equivalent to the flags claimed by Applicant].

27. As to claims 70 and 72, Permut discloses *allocating more readsets for the file in response to processing one or more write requests to the file* (since any writes involve more data which will introduce new read requests with new hints corresponding thereto).

Claim Rejections - 35 USC § 103

28. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

29. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Permut et al. (US Patent # 6,260,115) as applied to Claims 1 & 14 above, and further in view of Vishlitzky et al. (US Patent # 5,649,156), herein Vishlitzky.

30. As per Claim 15, Permut does not expressly disclose a *2 second queue refresh period*. However, Vishlitzky discloses the method of claim 14, wherein the predetermined period of time equals two seconds [Column 7, Lines 41-52]. Furthermore, Permut and Vishlitzky are analogous art because they are from the same

problem solving area: Prefetch cache optimization in multi-stream data storage systems. At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify the sequential prestaging queue flush, as taught by Permut, to refresh with a period of 2 seconds, as taught by Vishlitzky to be well known in the art. The suggestion/motivation for doing so would have been for the benefit of balancing a minimum amount of open storage and a maximize amount of data stored in the queue, as taught by Permut in Column 2, Line 51 - Column 3, Line 10, and because after 2 seconds of inactivity, the chances are small that data will not be accessed again within a reasonable period of time, as taught by Vishlitzky.

Conclusion

31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Patent No:

6,026,452 Network cache using metadata to prefetch data.

5,913,028 Client/server data delivery specifying read-ahead size (col. 9).

32. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary J. Portka whose telephone number is (571) 272-4211. The examiner can normally be reached on M-F 9:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gary J Portka
Primary Examiner
Art Unit 2188

August 6, 2007

GARY PORTKA
PRIMARY EXAMINER